The Geohydrology of the
Sidney-Molson Lakes Area, Okanogan County, Washington

By letter of May 9, 1972 this office was requested by Office of Field Operations to conduct a geohydrologic reconnaissance of the Sidney-Molson Lakes area to determine the impact of pumping in the total amount of 600 gpm (gallons per minute) and 390 acre-feet per year from two wells to be located within 100± feet of the lakes.

Location and Topography

The area of interest is about ten miles east of Oroville in the northeastern portion of Okanogan County near the U.S.-Canadian border in Township 40 North, Ranges 28 and 29 East. The elevation at the lakes is 3675 feet. The topography consists of rounded hills which are the products of glaciation and subsequent erosion. The topographic basin has an areal extent of 2.9 square miles and the combined surface area of Sidley and Molson Lakes is 129 acres. Precipitation averages about 20 inches annually.

Geology and Hydrology

This area was covered by ice during the Pleistocene and the results of this glaciation are manifest throughout. Glaciofluvial deposits left by the wasting glaciers mantle much of the region and only scattered outcrops of metamorphic bedrock are exposed. The bedrock is dense, lacks permeability and porosity and does not hold or transmit water except along fractures. Generally, when water is encountered in this unit the quantity is small and there is only enough for domestic supply and/or stock watering.

The glaciofluvial deposits which overlie the bedrock and underlie and surround the two lakes consists primarily of sand and gravel with some clay and silt. As a unit, this is a good to excellent aquifer. It is in this unit that the applicant proposes to dig two wells to be located adjacent to the lakes.

Four existing wells were found, each of which are not more than 75 feet from the lakes (Figure 1): Well 6M, at Sidley Lake Camp, was used to supply a summer camp consisting of 6 to 10 cabins. Well 6L which was not in use is across the county road from Sidley Lake. Formerly it was pumped for domestic supply and stock watering at a farm immediately uphill from the lake. Well 6R is near Molson Lake and was not in use. Well 8F, near Molson Lake, was used by the community of Molson for domestic supply.

Within the limits of accuracy of a hand level the elevations of the water levels in the wells and the water levels in the lakes were the same.

To check water level fluctuations in the two lakes and a well (6R) lying between the two, measuring points on fence posts extending into the lakes and at the top of the well casing were surveyed and tied into a common datum. As shown in Figure 2, all measurements but one indicate that the water surface of Molson Lake is higher than the water level in well 6R which is higher than the surface of Sidley Lake. It was also observed that the southeastern end of Molson Lake was 0.35 foot higher than the remainder from which it is separated by an abandoned railroad grade (see Figure 1). The differences in elevation suggest that the

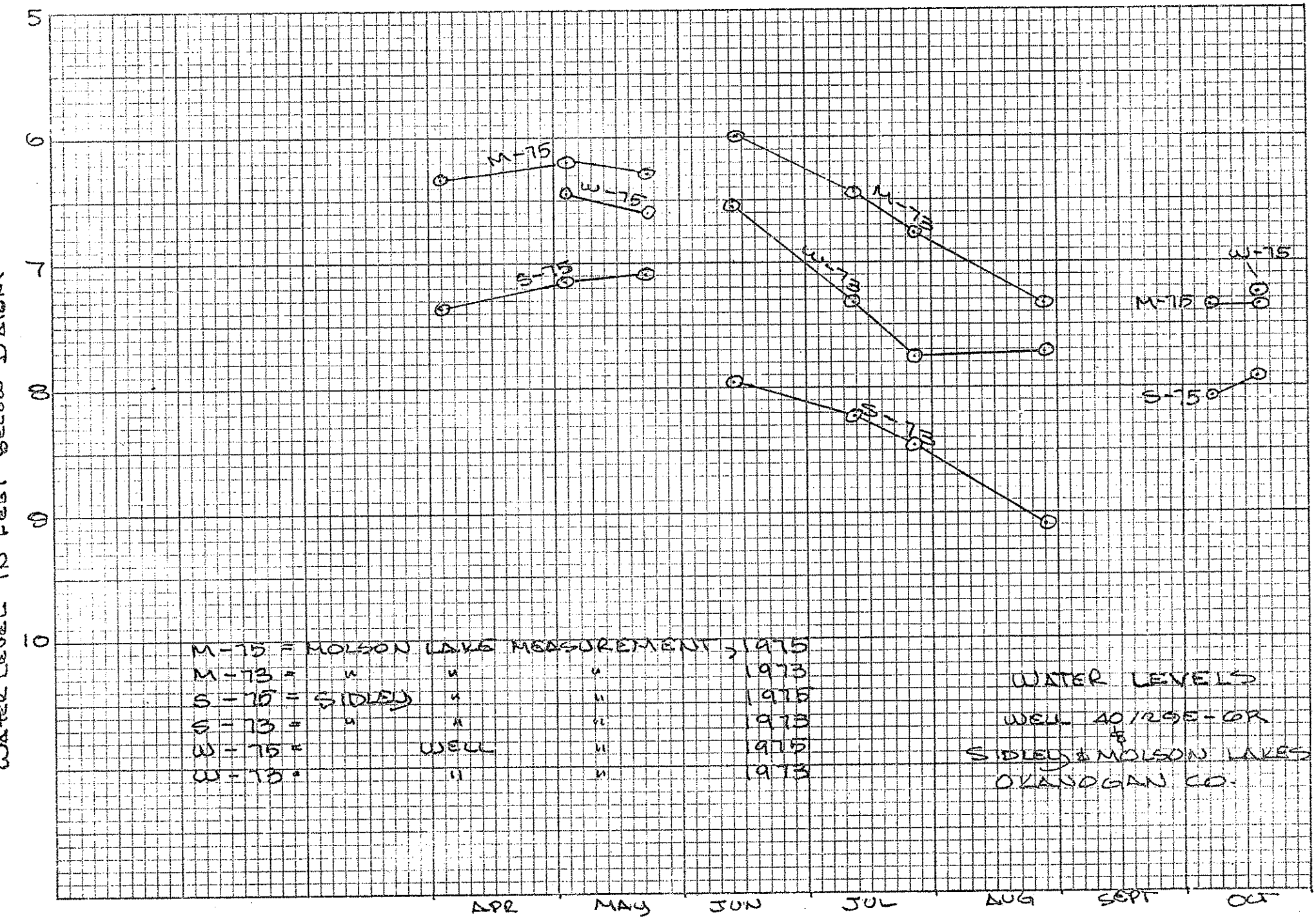

FIGURE 2

bottoms are sealed to some degree. The existence of hydraulic continuity between the lakes and the ground water, however, is suggested by the general parallelism of the water level plots.

In June 1973 there was no surface drainage from either of the two lakes and residents of the area said that none had been observed during the last 8 or 9 years (i.e. 1964 or 1965 to 1973). Reportedly drainage in the past has been primarily from Molson to Baker Creek and Kettle River but overflow has also occurred from Sidley Lake westward to Ninemile Creek and Osoyoos Lake.

Conclusions

Based on the water level measurements, a surface water gradient exists which slopes generally westward from Molson Lake to Sidley Lake. The differences in water levels in the two lakes and the well suggest that there is resistance to the flow of water from lake to lake and from the well to the lakes; i.e. the lake basins are somewhat but not totally sealed. Because the fluctuation of lake levels is reflected in the observation well, it is evident that pumping from wells adjacent to the lake will have an effect on the water levels of the lakes. If the total withdrawal of the 390 acre feet/year applied for were taken directly from the lake it would result in a $390/129 \simeq 3.0$ foot lowering of the lake level. This represents a maximum figure. If one assumes that the sand and gravel unit surrounding the lakes is in hydraulic continuity with the lakes, has a specific yield of 15% and an areal extent of 250 acres, the drawdown would be:

$$250 \text{ acres} \times 15\% \times d \text{ (feet)} + 129 \text{ acres} \times d \text{ (feet)} = 390 \text{ AF}$$
$$d = 2.3 \text{ feet}$$

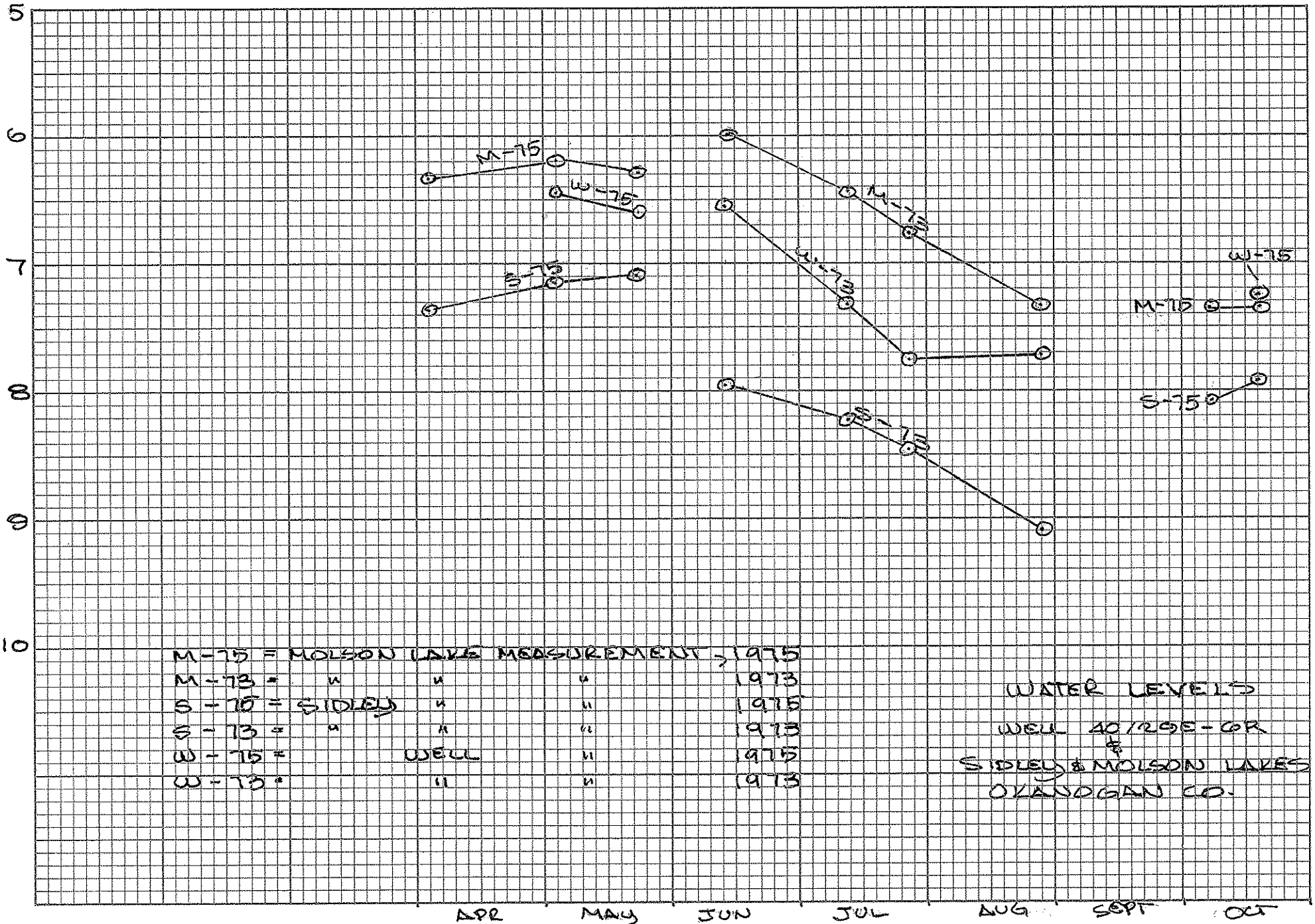

FIGURE 2

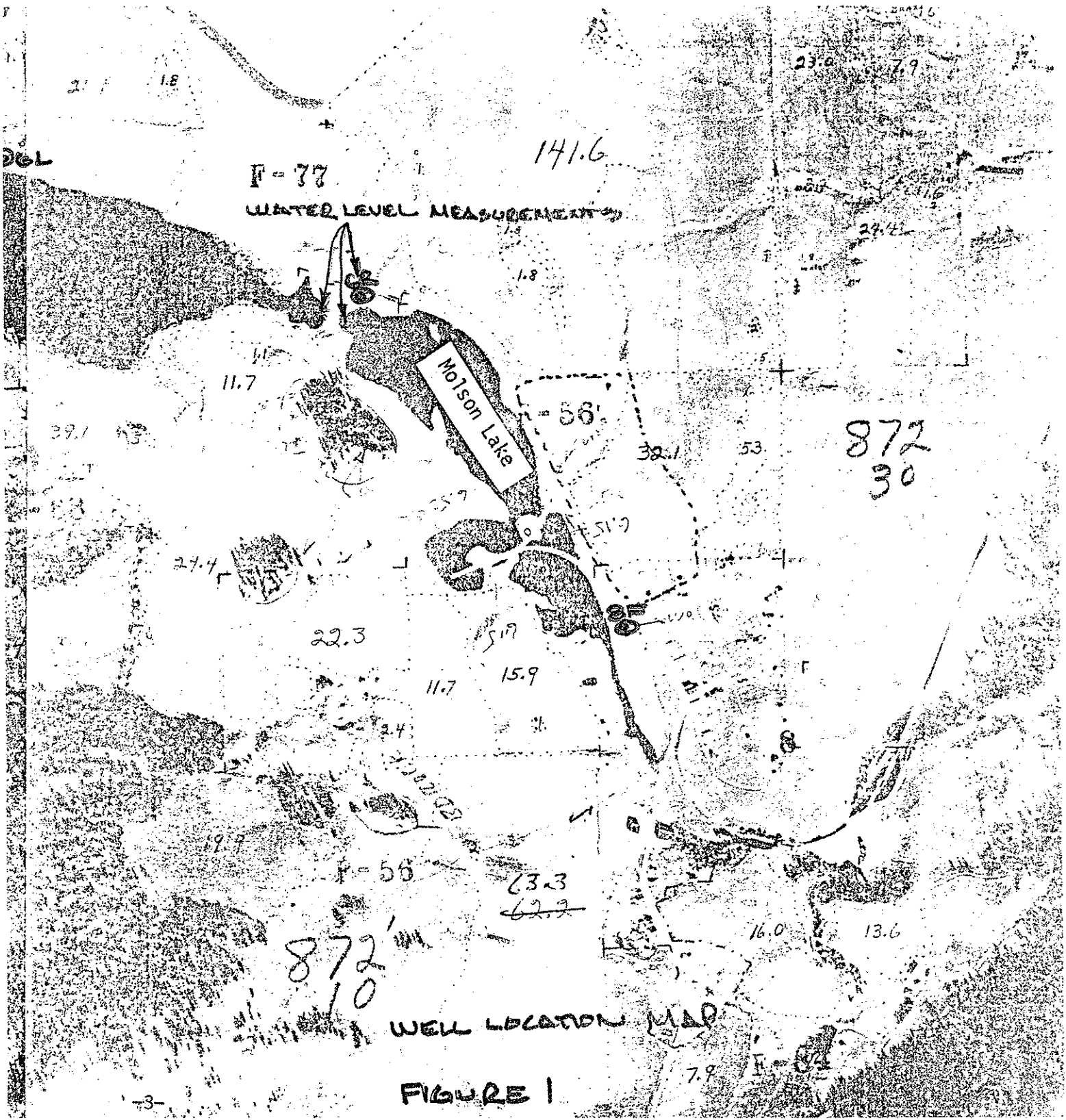
F-77
WATER LEVEL MEASUREMENTS
141.6
Molson Lake
F-56
63.3
872
10
872
30
WELL LOCATION MAP

FIGURE 1

The latter figure is highly conjectural but does suggest that the drawdown will not be appreciably reduced by including adjacent groundwater.

The natural drop in lake level based upon projection of measurements of 1973 and 1975 is 2 to 2.5 feet. This agrees with the U. S. Weather Bureau figure for evaporation which is 2.25 feet (Oroville).

Based on these data much of which are highly conjectural the total drawdown of the lake level might average 4 to 5 feet/year.

PG:ee